

REMARKS

Claims 1-30 are in the application. Claims 5, 8-10, 15-17, and 26-28 are withdrawn as being drawn to a non-elected invention. No claims are amended.

Claims 1-4, 6, 7, 11-14, 18-25, and 29-30 are rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over Claims 1-31 of U.S. Patent No. 5,763,016.

While Applicants do not acquiesce in the rejection, they present herewith a Terminal Disclaimer, signed by the undersigned, disclaiming the terminal portion of any patent that issues from the instant application, thereby obviating the rejection.

Claims 1-4, 6, 7, 11-14, 18-25, and 29-30 are rejected under 35 USC 103(a) as being unpatentable over Gupta et al (U.S. Patent 5,037,506) in view of Mayer et al (U.S. Patent 3,893,869) and further in view of Nachshon (U.S. Patent 5,114,834), Engelsberg ("Laser-Assisted Cleaning Proves Promising"), WO 97/17164, WO 9507152, Engelsberg et al (U.S. Patents 5,643,472 and 5,531,857) and Engelsberg (U.S. Patent 5,024,968).

Applicants' Claim 1 is reproduced below:

1. (original) An improved method for partially or completely removing organic coatings, films, layers or residues from a substrate, said method comprising:

(1) subjecting said substrate with said organic material thereon to a vapor consisting essentially of water-free gaseous sulfur trioxide for a period of time to at least partially react said organic material with said sulfur trioxide, said substrates being maintained at a temperature in said range from about room temperature to 400°C; and

(2) subjecting said substrate to a solvent rinse to at least partially remove said reacted organic material; wherein said improvement comprises said following steps:

(a) providing said substrate with said organic material thereon;

(b) subjecting said substrate of step (a) to a precursor chemical or physical treatment prior to step (1) capable of facilitating said reaction of said sulfur trioxide with said organic material to be removed;

(c) carrying out said step (1) so that said water-free, gaseous sulfur trioxide reacts with said organic material to form reacted and unreacted organic matter;

(d) optionally, subjecting said organic coatings, films, layers or residues to a pre-rinse chemical or physical treatment;

- (e) carrying out said step (2) to remove said reacted and unreacted organic matter from said substrate; and
- (f) subjecting said substrate to a chemical or physical post-rinse treatment subsequent to step (2) capable of removing any residual organic matter from said substrates remaining after said solvent rinse.

Applicants acknowledge that steps (1) and (2) are known; see, e.g., Gupta et al.

Gupta et al, discussed by Applicants in paragraph 0013 of the specification, disclose the use of gaseous sulfur trioxide to remove various organic coatings, polymerized photoresist, and especially implant and deep-UV hardened photoresist layers, during the manufacture of semiconductor or ceramic devices.

The Examiner states that Gupta et al teach a method "substantially the same as claimed except for the last laser cleaning step and the use of ultrasonic/megasonic cleaning during solvent treatment".

Applicants strenuously disagree. The steps disclosed by the Gupta et al patent are recited in the preamble of Claim 1 as steps (1) and (2). Applicants' invention is directed to an improvement over the Gupta et al process. The only two steps disclosed by Gupta et al is the exposure to sulfur trioxide and subsequent rinsing. There is absolutely not the slightest disclosure or suggestion of [1] Applicants' claimed step (b) (subjecting the organic coatings, films, layers, or residues of step (a) to a precursor chemical or physical treatment prior to step (1)) or of [2] Applicants' claimed step (e) (subjecting the organic coatings, films, layers, or residues to a chemical or physical post-rinse treatment subsequent to step (2)) or of [3] Applicants' claimed step (f) (subjecting said substrate to a chemical or physical post-rinse treatment subsequent to step (2) capable of removing any residual organic matter from the substrates remaining after the solvent rinse).

Accordingly, the burden is on the Examiner to provide references that disclose or suggest Applicants' steps (b), (e), and (f) of pre-treatment and post-rinse treatment, respectively. However, not one of the references cited by the Examiner discloses or suggests any of these steps in conjunction with sulfur trioxide treatment.

The Examiner cites Nachshon, Engelsberg, Engelsberg et al, WO 97/17164, and WO 95 07152 as purportedly showing “a precise cleaning and photoresists removal” as being conventional in the art.

However, there is not the slightest disclosure or suggestion that such laser cleaning is used in conjunction with a sulfur trioxide treatment. Indeed, these references all suggest complete removal of the resist by the disclosed procedures. There would be no incentive for one skilled in the art to include such a procedure as part of Applicants’ claimed process, including sulfur trioxide treatment.

The Examiner cites Mayer et al for showing the use of ultrasonic-megasonic energy during liquid treatment of a semiconductor wafer.

However, there is not the slightest disclosure or suggestion that the use of ultrasonic-megasonic energy is used in conjunction with a sulfur trioxide treatment. Indeed, all this reference fairly suggests is **cleaning** minute particles of dirt and grease from the surface of semiconductors. There is no disclosure of “liquid treatment” of semiconductor wafers, other than cleaning the surfaces thereof. Further, there is no disclosure that such liquid treatment may be used to remove hardened photoresist residues. Thus, there would be no incentive to include such a procedure as part of Applicants’ claimed process, including sulfur trioxide treatment.

The Examiner does not appear to have cited any references related to Applicants’ step (b) of Claim 1: “subjecting said substrate of step (a) to a precursor chemical or physical treatment [here, UV radiation] prior to step (1) capable of facilitating said reaction of said sulfur trioxide with said organic material to be removed”.

The Examiner has clearly indulged in the impermissible practice of extracting bits and pieces from several references to cobble together a facsimile of Applicants’ claims, without regard to the teachings as a whole. The Examiner is reminded that

“[t]he test for obviousness is not whether the features of one reference may be bodily incorporated into another reference. . . .

Rather, we look to see whether combined teachings render the claimed subject matter obvious.”

In re Wood, 202 USPQ 171, 174 (C.C.P.A. 1979).

The claim must be considered **as a whole**. The inclusion of separate references in a rejection to represent each of the different features described in the

claims of the application is a sign that the Examiner is attempting to piece together the claimed invention using the claims as a guide. That is, the Examiner is using Applicants' claims as an instruction manual to find the appropriate prior art that might render the claims obvious. In this process, the Examiner has lost sight as to the real issue: whether it would have been obvious to combine with references **without** having access to the instant application. As stated by the Federal Circuit,

“although *Graham v. John Deere Co.* . . . requires that certain factual inquiries, among them the differences between the prior art and the claimed invention, be conducted to support a determination of the issue of obviousness, the actual determination of the issue requires an evaluation in the light of the findings in those inquiries of the obviousness of the claimed invention as whole, not merely the differences between the claimed invention and the prior art.”

Lear Siegler, Inc. v. Aeroquip Corp., 221 USPQ 1025, 1033 (Fed. Cir. 1984).

Thus, it is not correct for the Examiner merely to focus on the differences between the prior art and the claimed invention, and then to state that the differences themselves or individually are obvious. The claimed invention **as a whole** is to be considered. Further, it is impermissible for the Examiner to use the application itself as the basis or reason for formulating the obviousness rejection. As the Federal Circuit has stated:

“It is impermissible to use the claimed invention as an instruction manual or ‘template’ to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that ‘[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.’”

In re Fritch, 23 USPQ 2d 1780, 1783–84 (Fed. Cir. 1992)

Not only the claimed invention as a whole must be considered, but also the prior art as a whole must be considered. See, for example, *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 488 (Fed. Cir. 1984), in which the Court stated:

"The '315 patent specifically stated that it disclosed and claimed a combination of features previously used in two separate devices. That fact alone is not fatal to patentability. The claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination."

Note also a decision by the Federal Circuit in *Akzo N.V. v. United States International Trade Commission*, 1 USPQ 2d 1241, 1246 (Fed. Cir. 1986), cert. denied, 482 U.S. 909 (1987), in which the Court stated:

"[P]rior art references before the tribunal must be read as a whole and consideration must be given where the references diverge and teach away from the claimed invention. . . . Moreover, appellants cannot pick and choose among individual parts of assorted prior art references 'as a mosaic to recreate a facsimile of the claimed invention.'"

The foregoing case law is cited to remind the Examiner that the references **as a whole** must also be considered, even as the claimed invention **as a whole** must be considered. Applicants contend that the Examiner has ignored the teachings of the references as a whole in finding obviousness in Applicants' claimed invention.

Gupta et al fail to disclose any pre-treatment or any post-treatment steps (other than the solvent rinse of step (2)). The Examiner is simply tacking on other references that purportedly show aspects of Applicants' pre-treatment or post-treatment steps. However, simply tacking on these references that bear no relationship to SO₃ treatment is in error, as discussed above. As an example, megasonic post-treatment will **not** remove any hardened photoresist residues in the absence of SO₃ treatment of the photoresist (or some other treatment that makes the photoresist amenable to removal by megasonics), and there is not the slightest disclosure or suggestion in that reference that megasonic treatment would so remove hardened photoresist residues at all.

Applicants have recognized that (1) SO₃ does not necessarily completely remove hardened photoresist and (2) that pre-treatment and/or post-treatment will help remove anything not removed by SO₃ and subsequent rinse.

For the foregoing reasons, the Examiner has failed to cite references that disclose or suggest Applicants' pre-treatment step (b) and post-rinse treatment step (e) in combination with exposure to sulfur trioxide.

The Examiner has cited nine (9) references against the claims, with each reference purportedly teaching a step of Applicants' claimed method. Yet, the only reference having anything to do with a method of removing organic coatings employing sulfur trioxide is the primary reference, Gupta et al. None of the other applied references teach anything with regard to using sulfur trioxide for such cleaning, and it is clear that the Examiner has used Applicants' claims as a template to find each of the recited steps in a separate reference. This is clearly impermissible hindsight reconstruction of Applicants' claims, as indicated above.

Further, the use of the individual teachings in this manner, without regard to the overall teachings of each reference, clearly borders on the discredited "obvious to try" test. That is, the Examiner, by extracting the individual teachings of each reference to show specific steps of Applicants' recited invention, is at least implying, if not suggesting, that it would have been obvious to try the extracted process step to come up with Applicants' claimed invention.

For example, the Examiner cites Mayer et al for its teaching of megasonic cleaning. However, step (d) of Applicants' Claim 1 recites "optionally, subjecting said organic coatings, films, layers or residues to a pre-rinse chemical or physical treatment [here, ultrasonic/megasonic sound energy]". This step is preceded by exposure to sulfur trioxide and is followed by a solvent rinse. There is no disclosure or suggestion in Mayer et al that their teachings would be useful in such a process sequence.

As another example, the Examiner cites Nachshon, Engelsberg, Engelsberg et al, WO 97/17164, and WO 9507152 for their teaching of "precise cleaning and photoresists removal by lasers". Step (f) of Applicants' Claim 1 recites "subjecting said substrate to a chemical or physical post-rinse treatment [here, laser] subsequent to step (2) *capable of removing any residual organic matter from said substrates remaining after said solvent rinse*". Nachshon (laser scanning of a semiconductor wafer surface in a dry atmosphere), however, fails to teach that his invention is capable of removing any residual organic matter from the substrates remaining af-

ter the solvent rinse. Indeed, Applicants can find no mention of a solvent rinse preceding the laser treatment. Likewise, Engelsberg and both Engelsberg et al references (irradiating undesired material with energetic photons in a flowing inert gas) fail to teach that the invention is capable of removing any residual organic matter from the substrates remaining after the solvent rinse. Further, WO 95/07152 (delivering a beam of radiation to a directed flow of a fluid, including a reactant, to foreign material to form a reaction product) fails to teach that the invention is capable of removing any residual organic matter from the substrates remaining after the solvent rinse. Finally, WO 97/17164 (preventing surface damage of an object being laser treated by extending the laser pulse generated by a laser, before it reaches the surface to be ablated) fails to teach that the invention is capable of removing any residual organic matter from the substrates remaining after the solvent rinse.


The Examiner argues that each of the process steps is "notoriously well-known and conventional in the art". However, this is true of just about all process steps in any method/process claim. What renders patentability is the sequence of steps to produce a desired end result. The Examiner has failed to cite references that, in combination, fairly teach the sequence of steps claimed by Applicants.

Reconsideration of the rejection of Claims 1-4, 6, 7, 11-14, 18-25, and 29-30 under 35 USC 103(a) as being unpatentable over Gupta et al in view of Mayer et al and further in view of Nachshon, Engelsberg ("Laser-Assisted Cleaning Proves Promising"), WO 97/17164, WO 9507152, Engelsberg et al and Engelsberg is respectfully requested.

The application is considered to be in condition for allowance. The Examiner is respectfully requested to take such action. If the Examiner has any questions, he is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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March 3, 2008



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